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Introduction: Since "layered structure" became one focus in compounds with significant magnetic properties or phenomena, a lot of layered compounds were synthesized and investigated. Rare earth tritellurides (RTe$_3$) have been added to this list, when the rare-earth metal polytellurides RTe$_2$ and RTe$_3$ were reported that they have common basic structure with the alternate layers (Te layer and RTe layer) [1]. It was reported that Gadolinium tritelluride ($GdTe_3$) exhibits Charge Density Wave (CDW) transition at 380 K [2]. What's more, $GdTe_3$ single crystal exhibits two features in temperature dependence of magnetic susceptibility with only one antiferromagnetic transition at 11.5K and a spin-flop transition around 4K ($\boldsymbol{H}\perp\boldsymbol{c}$) [1]. However, two Neel temperature of $GdTe_3$ with 11.3 K and 9.7 K were reported by studying specific heat [3]. The specific heat figure also shows another faint anomaly at 7 K, although they have not pointed it out. So we studied magnetic properties of $GdTe_3$ single crystal again in here.

Experimental results and discussion: Single crystal of $GdTe_3$ was prepared by a flux method using alkaline metal chlorides. The mixture of the Gd and Te powder with total weight of 1 g was sealed in an evacuated quartz tube together with 2 g of the flux (LiCl:RbCl =1:1). The quartz tube was kept at 650 ℃ for two days. Then the temperature was gradually lowered to 540 ℃ in four days. The structure measurement was made by X-ray diffraction method. The magnetic measurements were performed by MPMS. By X-ray diffraction of surface of flake-shaped $GdTe_3$ single crystal, we found (001) face of a weakly orthorhombic crystal structure (space group *Cmcm*). **Figure 1** shows temperature dependence of the magnetic susceptibility of $GdTe_3$ single crystal in 1 T (F.C. / Z.F.C.). It can be seen that there is a broad peak with maximum at 13 K and an inflection point at 9.5 K ($\boldsymbol{H}\perp\boldsymbol{c}$), and that there exists another salient point at 11.5 K for $\boldsymbol{H}//\boldsymbol{c}$. This phenomenon is good enough to support idea of two Neel temperature of $GdTe_3$ with 11.3 K and 9.7 K. In addition, we also found a small anomaly at 7 K and ZFC-FC effect below 7 K for $\boldsymbol{H}\perp\boldsymbol{c}$ in 1 T. To further study, we measured temperature dependence of the magnetic susceptibility ($\boldsymbol{H}\perp\boldsymbol{c}$) of $GdTe_3$ single crystal in different magnetic field (0.1, 0.5, 1, 2, 3 and 5 T), shown like **Figure 2**. It shows that a valley appears at 8.8 K and ZFC-FC effect is observed below 8.8 K when the magnetic field turns to 2 T. Then, we consider that the valley is generated from the small anomaly at 7 K. But we don't know what the phenomena originate from.

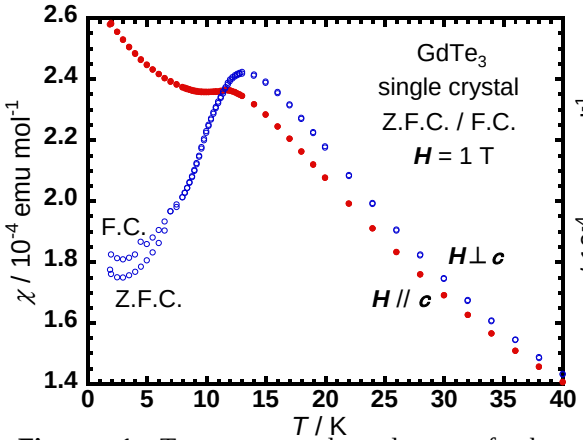

Figure 1 Temperature dependence of the magnetic susceptibility (Z.F.C. / F.C.) of $GdTe_3$ single crystal measured in the field of 1 T.

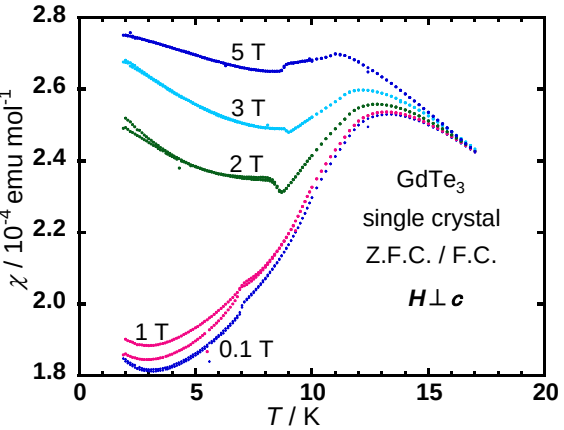

Figure 2 Temperature dependence of the magnetic susceptibility (Z.F.C. / F.C.) of $GdTe_3$ single crystal measured in 0.5, 1, 2, 3 and 5 T.

Refs: [1] Y. Iyeiri et al. Phys. Rev. B **67**, 144417 (2003). [2] N. Ru et al. Phys. Rev. B **77**, 035114 (2008). [3] N. Ru et al. Phys. Rev. B **78**, 012410 (2008).